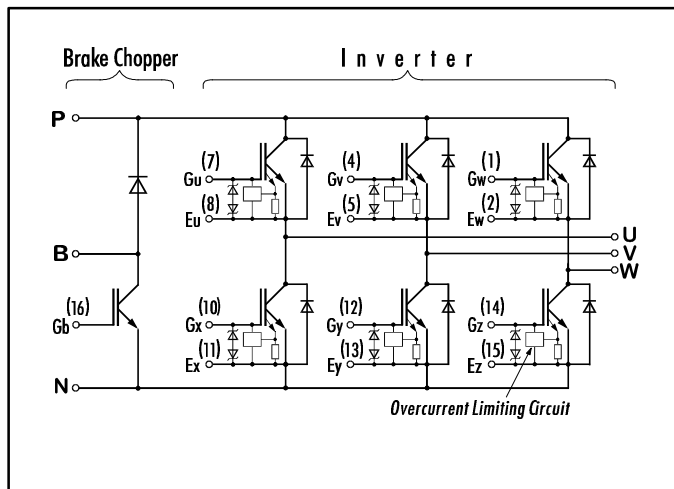


IGBT MODULE (N series)

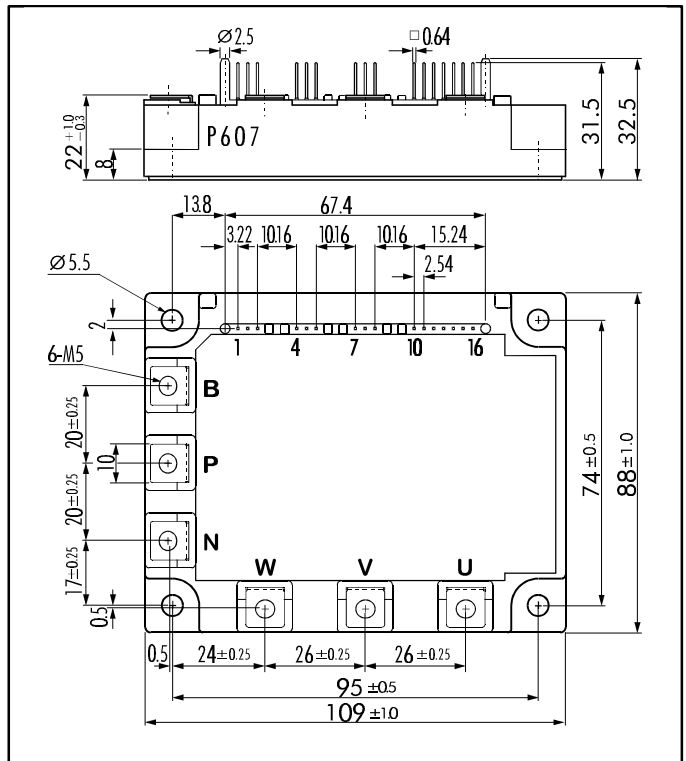
■ Features

- Including Brake Chopper
- Square RBSOA
- Low Saturation Voltage
- Overcurrent Limiting Function
(4 ~ 5 Times Rated Current)

■ Equivalent Circuit



■ Outline Drawing



■ Absolute Maximum Ratings (T_c=25°C)

Items		Symbols	Test Conditions	Ratings	Units
Inverter	Collector-Emitter Voltage	V _{CES}		1200	V
	Gate -Emitter Voltage	V _{GES}		± 20	
	Collector Current	I _C	Continuous	50	A
		I _{C PULSE}	1ms	100	
	Collector Power Dissipation	P _C	1 device	400	W
Brake Chopper	Collector-Emitter Voltage	V _{CES}		1200	V
	Gate -Emitter Voltage	V _{GES}		± 20	
	Collector Current	I _C	Continuous	25	A
		I _{C PULSE}	1ms	50	
	Collector Power Dissipation	P _C	1 device	200	W
	Repetitive Peak Reverse Voltage	V _{RRM}		1200	V
	Average Forward Current	I _{F(AV)}		1	A
FWD	Surge Current	I _{FSM}	10ms	50	
Operating Junction Temperature		T _j		+150	°C
Storage Temperature		T _{Stg}		-40 ~ +125	
Isolation Voltage		V _{ISO}	A.C. 1min.	2500	V
Mounting Screw Torque *1				3.5	Nm
Terminal Screw Torque *1				3.5	

Note: *1:Recommendable Value; 2.5 ~ 3.5 Nm (M5)

■ Electrical Characteristics($T_j=25^{\circ}\text{C}$)

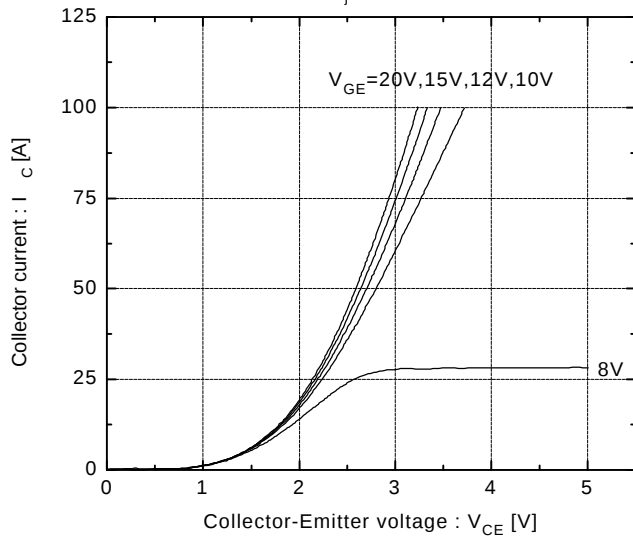
Items		Symbols	Test Conditions	Min.	Max.	Units	
Inverter	IGBT	Zero Gate Voltage Collector Current	I _{CES}	V _{GE} =0V V _{CE} =1200V		3.0	mA
		Gate-Emitter Leakage Current	I _{GES}	V _{CE} =0V V _{GE} =± 20V		15	μA
		Gate-Emitter Threshold Voltage	V _{GE(th)}	V _{GE} =20V I _C =50mA	4.5	7.5	V
		Collector-Emitter Saturation Voltage	V _{CE(sat)}	V _{GE} =15V I _C =50A		3.3	
		Input capacitance	C _{ies}	f=1MHz, V _{GE} =0V, V _{CE} =10V	8000 (typ.)		pF
		Turn-on Time	t _{on}	V _{CC} =600V I _C = 50A		1.2	μs
			Turn-off Time	t _{off}	V _{GE} =±15V		
	t _f			R _G = 24Ω		0.5	
	FWD	Diode Forward On-Voltage	V _F	I _F =50A V _{GE} =0V		3.0	V
Reverse Recovery Time		t _{rr}	I _F =50A; V _{GE} =-10V; ^{-di} /dt=150 A/μs		350	ns	
Brake Chopper	IGBT	Zero Gate Voltage Collector Current	I _{CES}	V _{GE} =0V V _{CE} =1200V		1.0	mA
		Gate-Emitter Leakage Current	I _{GES}	V _{CE} =0V V _{GE} =± 20V		100	nA
		Collector-Emitter Saturation Voltage	V _{CE(sat)}	V _{GE} =15V I _C =25A		3.3	V
		Turn-on Time	t _{on}	V _{CC} =600V I _C = 25A		1.2	μs
			Turn-off Time	t _{off}	V _{GE} =±15V		
	t _f			R _G = 51Ω		0.5	
	FWD	Reverse Current	I _{RRM}	V _R =1200V		1.0	mA
Reverse Recovery Time		t _{rr}			600	ns	

■ Thermal Characteristics

Items	Symbols	Test Conditions	Min.	Max.	Units
Thermal Resistance (1 device)	$R_{th(f-c)}$	Inverter IGBT		0.31	$^{\circ}\text{C/W}$
		Inverter FRD		0.85	
		Brake IGBT		0.63	
Contact Thermal Resistance	$R_{th(c-f)}$	With Thermal Compound	0.05 (typ.)		

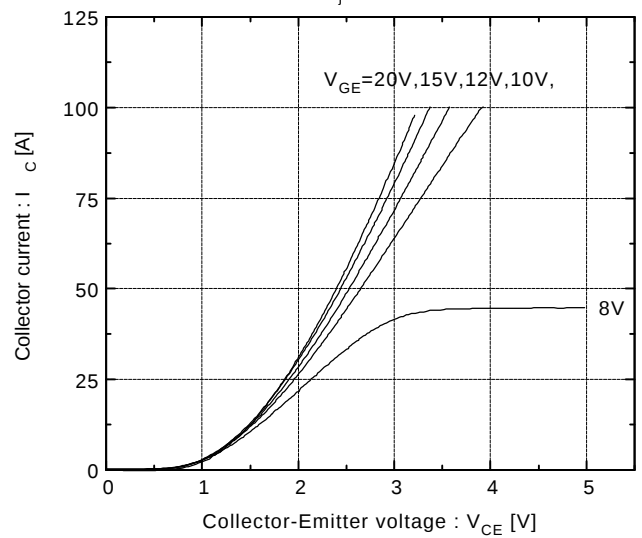
Collector current vs. Collector-Emitter voltage

$T_j = 25^\circ\text{C}$



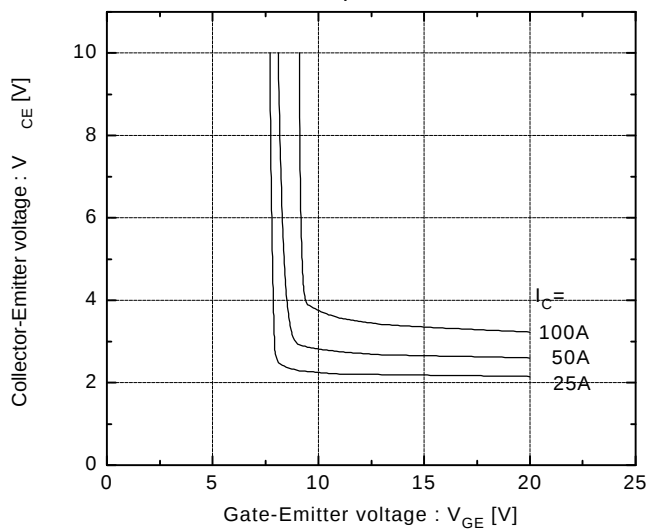
Collector current vs. Collector-Emitter voltage

$T_j = 125^\circ\text{C}$



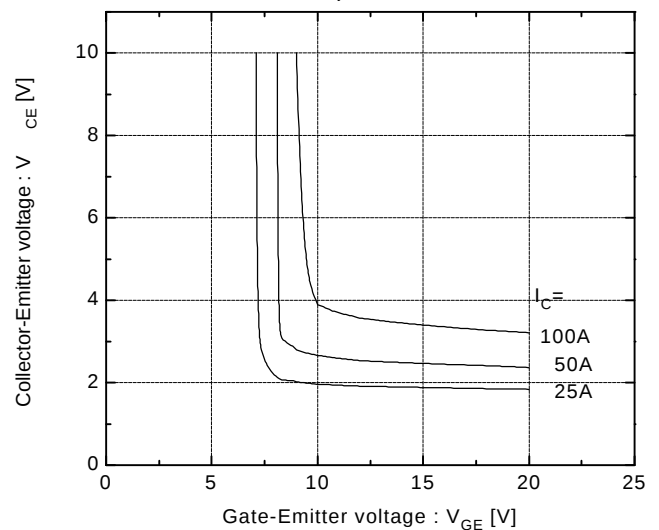
Collector-Emitter vs. Gate-Emitter voltage

$T_j = 25^\circ\text{C}$



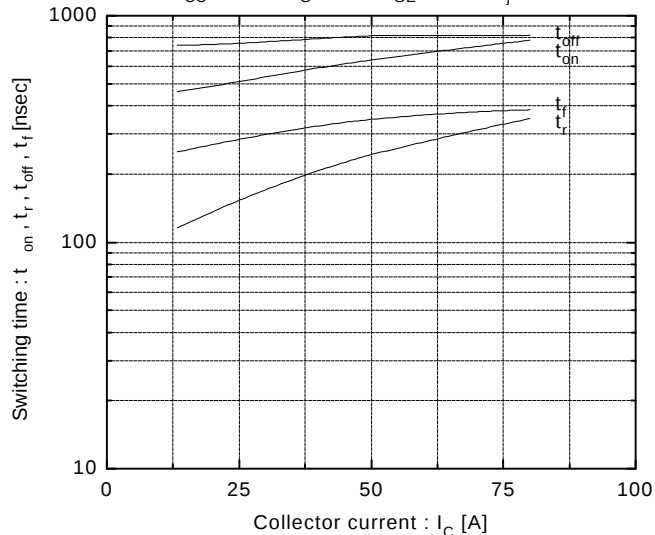
Collector-Emitter vs. Gate-Emitter voltage

$T_j = 125^\circ\text{C}$



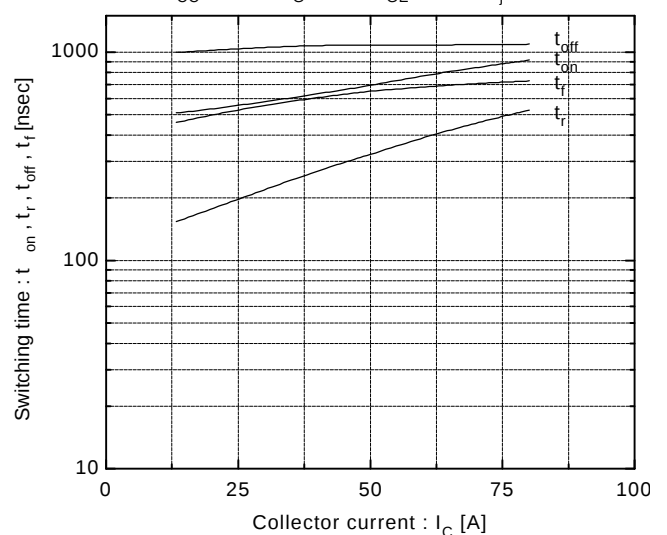
Switching time vs. Collector current

$V_{CC} = 600\text{V}$, $R_G = 24\Omega$, $V_{GE} = \pm 15\text{V}$, $T_j = 25^\circ\text{C}$



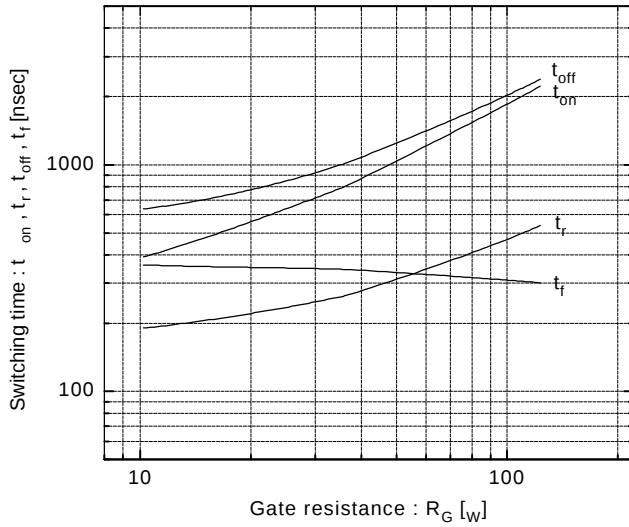
Switching time vs. Collector current

$V_{CC} = 600\text{V}$, $R_G = 24\Omega$, $V_{GE} = \pm 15\text{V}$, $T_j = 125^\circ\text{C}$



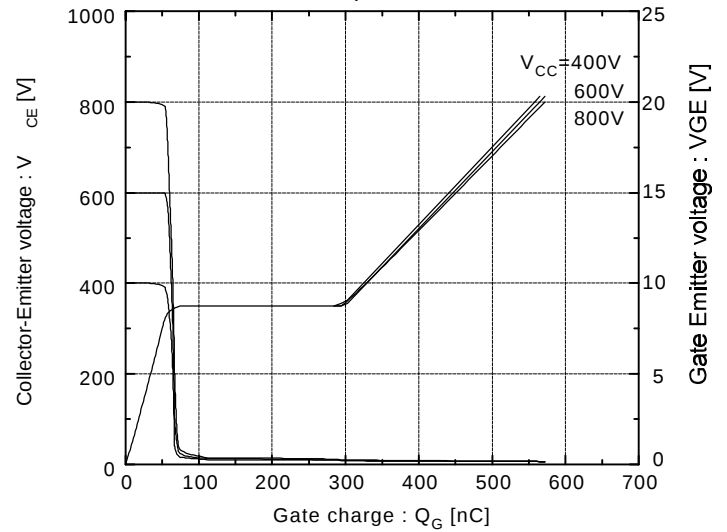
Switching time vs. R_G

$V_{CC}=600V$, $I_C=50A$, $V_{GE}=\pm 15V$, $T_J=25^\circ C$



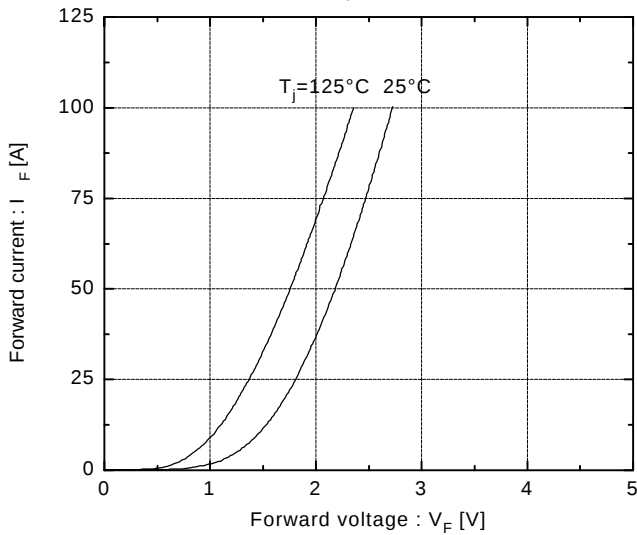
Dynamic input characteristics

$T_J=25^\circ C$



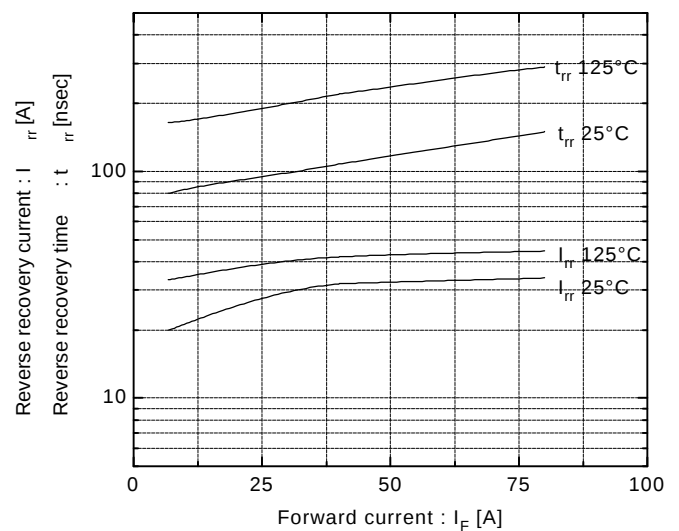
Forward current vs. Forward voltage

$V_{GE}=0V$

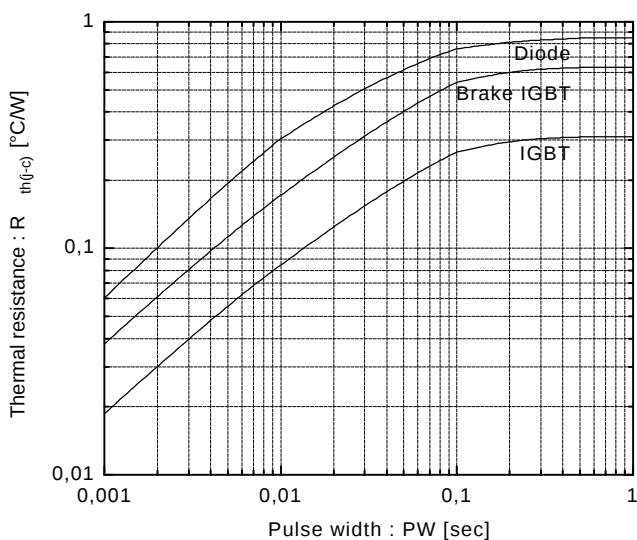


Reverse recovery characteristics

t_{rr} , I_{rr} vs. I_F

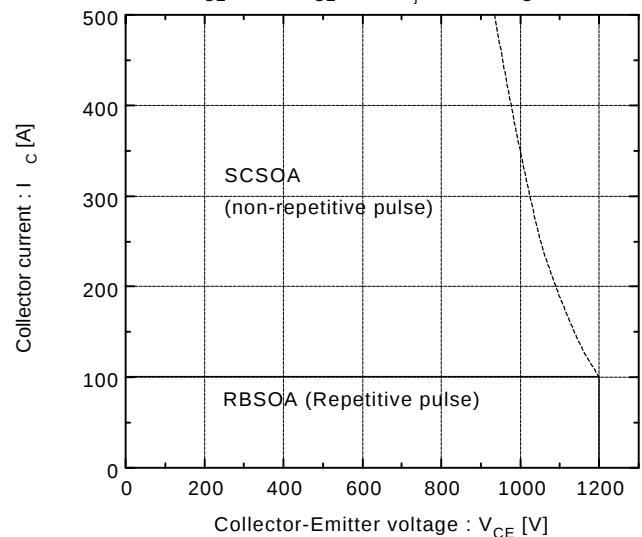


Transient thermal resistance



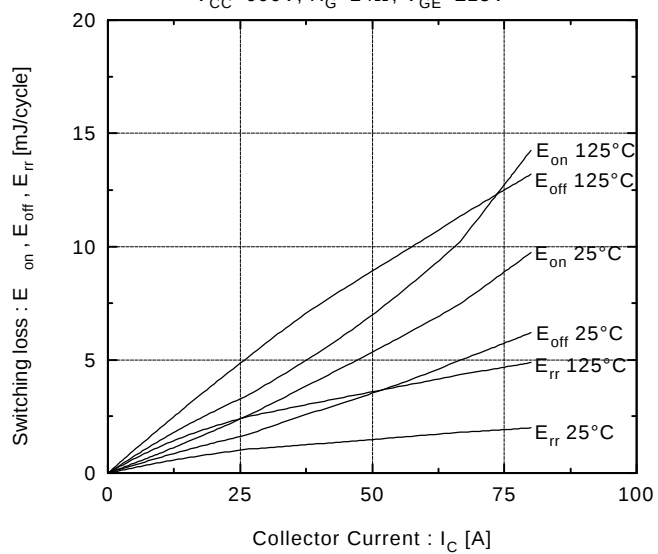
Reversed biased safe operating area

$+V_{GE}=15V$, $-V_{GE}\leq 15V$, $T_J\leq 125^\circ C$, $R_G\geq 24\Omega$



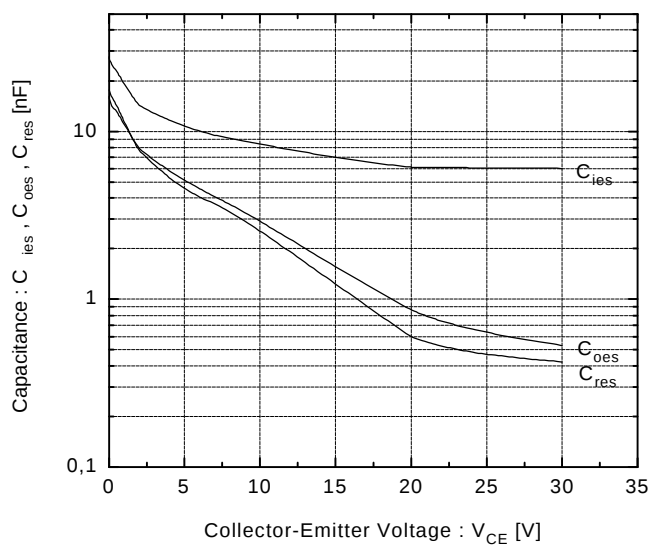
Switching loss vs. Collector current

$V_{CC}=600V$, $R_G=24\Omega$, $V_{GE}=\pm 15V$



Capacitance vs. Collector-Emitter voltage

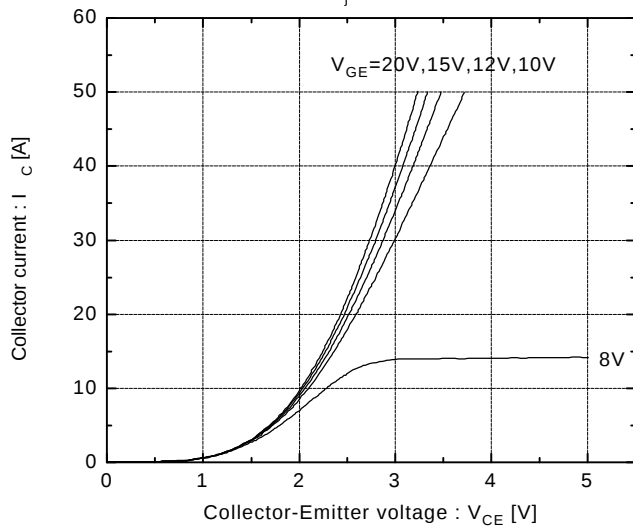
$T_J=25^\circ C$



Brake Chopper IGBT

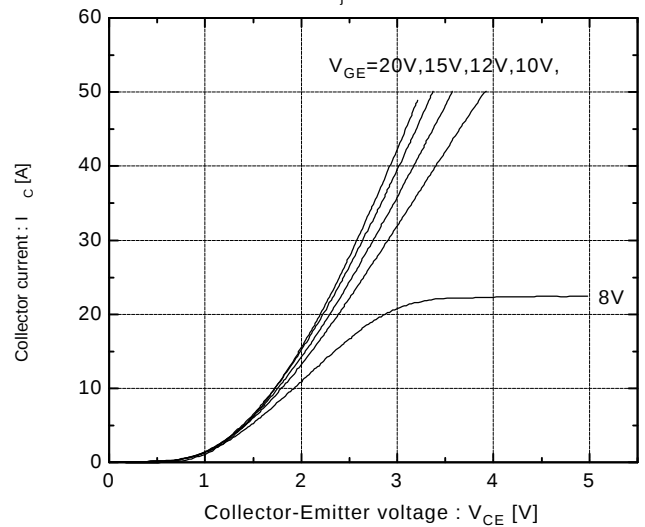
Collector current vs. Collector-Emmitter voltage

$T_J = 25^\circ\text{C}$



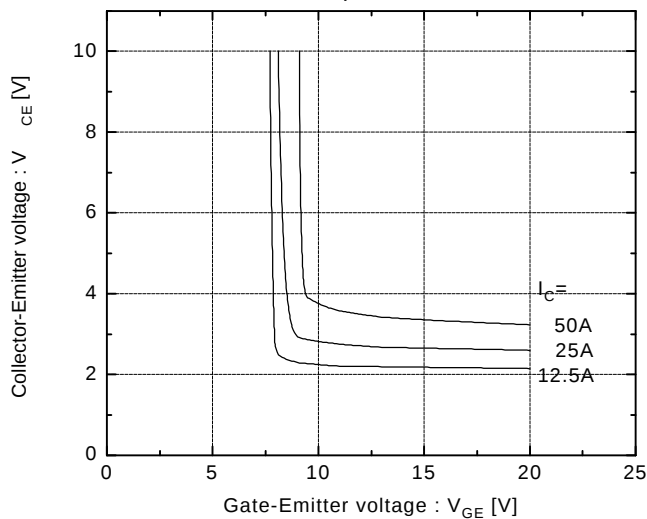
Collector current vs. Collector-Emmitter voltage

$T_J = 125^\circ\text{C}$



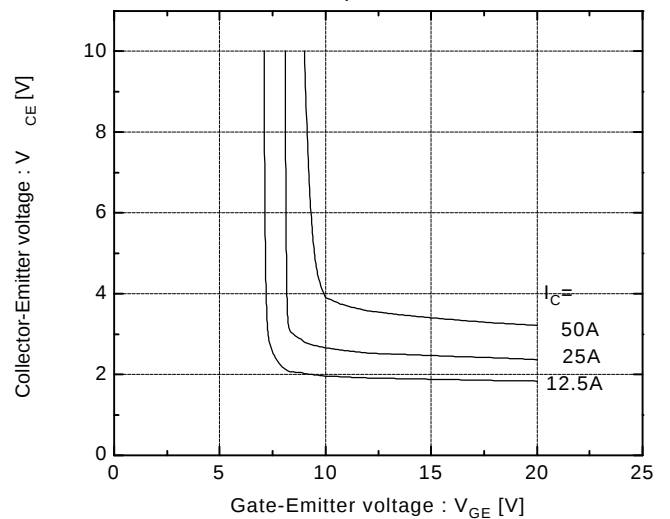
Collector-Emmitter vs. Gate-Emmitter voltage

$T_J = 25^\circ\text{C}$

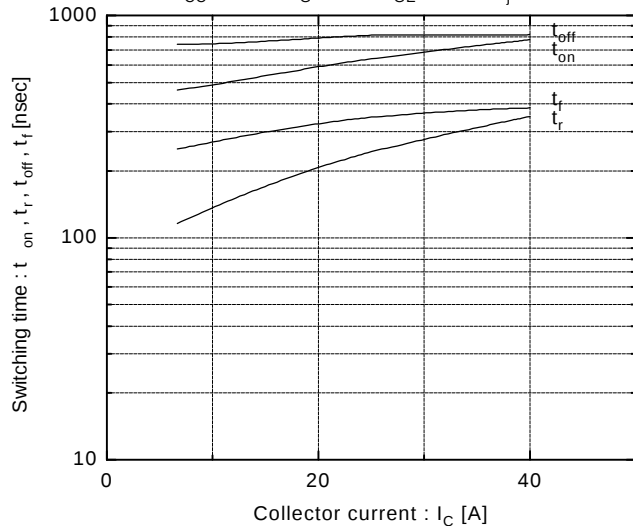


Collector-Emmitter vs. Gate-Emmitter voltage

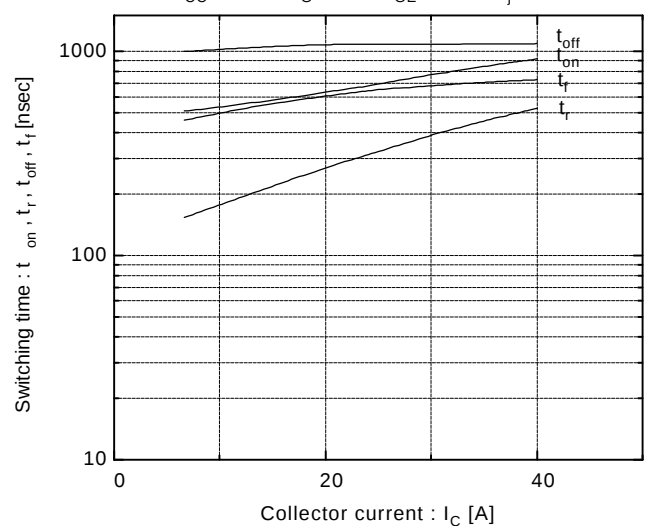
$T_J = 125^\circ\text{C}$



Switching time vs. Collector current
 $V_{CC} = 600\text{V}$, $R_G = 51\Omega$, $V_{GE} = \pm 15\text{V}$, $T_J = 25^\circ\text{C}$



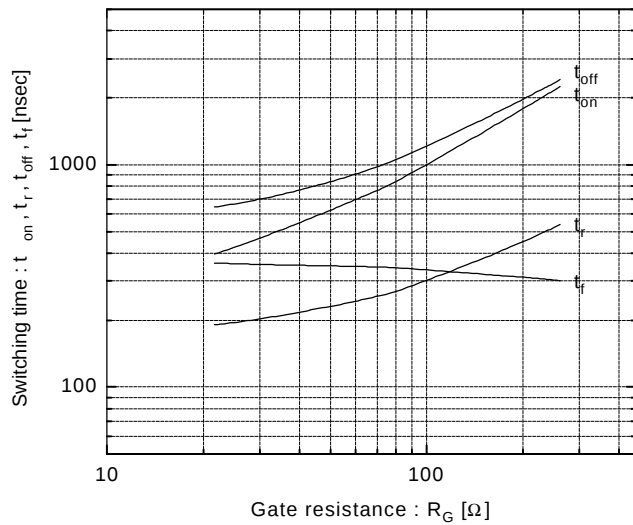
Switching time vs. Collector current
 $V_{CC} = 600\text{V}$, $R_G = 51\Omega$, $V_{GE} = \pm 15\text{V}$, $T_J = 125^\circ\text{C}$



Brake Chopper IGBT

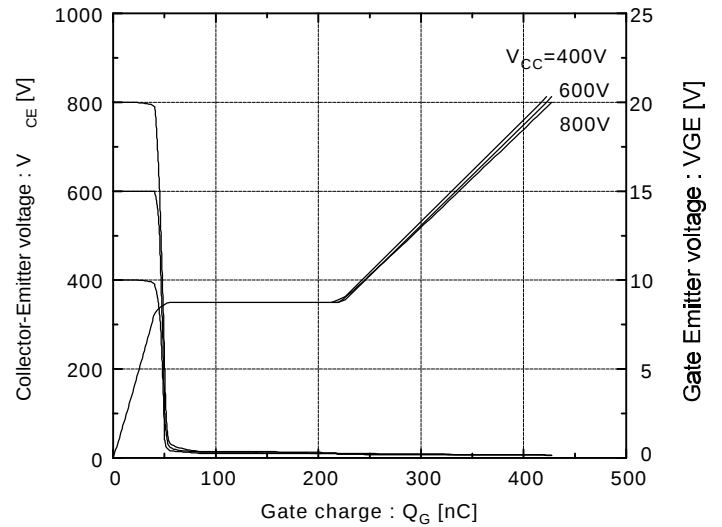
Switching time vs. R_G

$V_{CC}=600V$, $I_C=25A$, $V_{GE}=\pm 15V$, $T_J=25^\circ C$

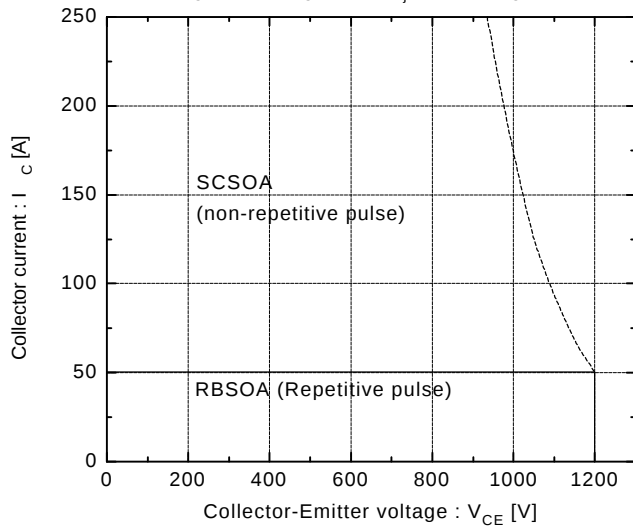


Dynamic input characteristics

$T_J=25^\circ C$

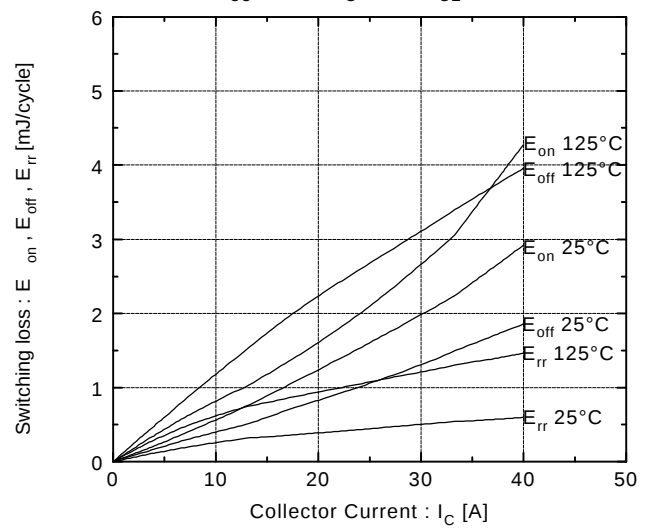


Reversed biased safe operating area
 $+V_{GE}=15V$, $-V_{GE}\leq 15V$, $T_J\leq 125^\circ C$, $R_G\geq 51\Omega$



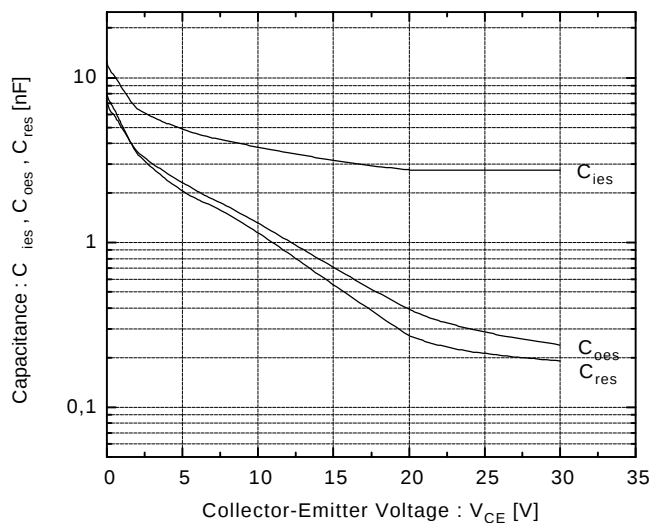
Switching loss vs. Collector current

$V_{CC}=600V$, $R_G=51\Omega$, $V_{GE}=\pm 15V$



Capacitance vs. Collector-Emitter voltage

$T_J=25^\circ C$



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